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ABSTRACT

The industrial arts curriculum for the Fort Benton school system was designed with funds under Title III of the Elementary and Secondary Education Act as part of the vocational technology curricula to develop skills and attitudes that will permit students to find satisfaction and success in their careers. The curriculum, designed for grades 7-12, includes courses in mechanical drawing, woodworking, general arts and crafts, metal crafts, and ceramics. Objectives and instructional resources are specified for each course. (JH)

BENTON INDUSTRIAL ARTS CURRICULUM OUTLINE



industrial arts

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FORT BENTON INDUSTRIAL ARTS CURRICULUM OUTLINE

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PREFACE

The means by which a small rural school system might provide a continuing curriculum development process are limited fiscally in most areas of Montana. Through the acquisition of a federal grant under ESEA Title III, we in the Fort Benton system have been able to overcome this limitation to some degree. Found in the pages of this curriculum outline are the efforts of Fort Benton teachers and administrators as well as the efforts of personnel from seven other Montana schools.

In today's paper world we often measure success by the volume of the printed word. The efforts put forth by the people involved in this project in no way can be acknowledged simply through an observance of volume. The real success of the program appears in the regeneration of teaching philosophy, methodology and enthusiasm. These in most part will show in the benefits rendered the students in the years to come.

I am not only proud to have been a part of this project, but also thank all the people involved for their cooperation. Any success or benefits of the project are theirs.

Members of this project from the Fort Benton School system will be available for consultant service to any organization or school district with regard to the outline contained herein or any other part of the project.

William J. Hoppes
Superintendent of Schools

STATEMENT OF PHILOSOPHY

Our primary purpose is to create vocational technology curriculums in specific areas which will help each student develop into a constructive citizen. The student will have the opportunity to develop cooperative attitudes toward society, acquire values consistent with the democratic creed and obtain a dependable body of knowledge and technical skills. The Vo-Tech curriculums will assist in the development of those skills and attitudes which will permit students to find satisfaction and success in their careers.

We believe that in order to make our vocational technology curriculums more meaningful for our students a planned scope and sequence is necessary. In order to accomplish this, the student will explore areas within the scope of vocational technology. These areas are Business Education, Home Economics, Agri-Industry, Trades and Industry, and Industrial Arts.

Through these vocational technology areas, the student will have the opportunity to integrate into his life learning processes, self-expression and skill development.

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INTRODUCTION

This Industrial Arts Curriculum was developed primarily for the Fort Benton School System by a committee representing several Montana School districts. The project was funded through an ESEA Title III grant to the Fort Benton Public Schools.

The writing of this curriculum outline involved a highly concentrated six-week effort on the part of each individual committeeman. The Industrial Arts curriculum project personnel were:

James A. Longin	Fort Benton	Project Director
Robert Jerome	Fort Benton	Group Leader
Rus Axtman	Fort Benton	Student Consultant
James Wolf	Fort Benton	
Gary Anderson	Chinook	

TERMINOLOGY

1. BATIK - an Indonesian method of hand printing textiles by coating parts of the fabric with wax to resist dye.
2. BEHAVIORAL INSTRUCTIONAL OBJECTIVE - refers to those objectives used to measure the terminal behavior of the student which are intended to develop the behavioral concept and in turn the grade level theme.
3. BEHAVIORAL CONCEPT - refers to those concepts written in behavioral terms which are intended to further develop the grade level theme.
4. CLOISONNE - separating areas of applied enamel colors with very fine wire, each color forming its own partition or cell (cloison).
5. GOALS - refers to those thirteen basic goals established by this committee as the over-all concern of this curriculum.
6. GRADE LEVEL THEME - refers to that theme which is being developed at that particular grade level.
7. LOST WAX CASTING - a model or pattern of the finished product is made in wax. This pattern is then surrounded by a creamy investment plaster that hardens to form a mold. During the mold heating (burnout) that follows, the wax pattern melts away and is "lost". Metal is then cast into the cavity left by the "lost wax", thus duplicating the original wax pattern. The mold is then destroyed to recover the casting.
8. MAJOR THEME - refers to that theme which is being developed throughout the entire curriculum, "the expanding social order".
9. SPRUE - wax passageways that support the pattern on a base in the desired position, provide passageways for wax elimination and form feed line through which molten metal enters the mold.
10. TOUCHE - a black liquid used in preparing silk screen stencils. Touche is applied to areas of the screen you want to print. When dry, glue is applied. When the glue is dry, touche is removed with turpentine.

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BASIC GOALS

This project group identified thirteen basic goals in the field of Vo-Tech. These goals are stated as follows:

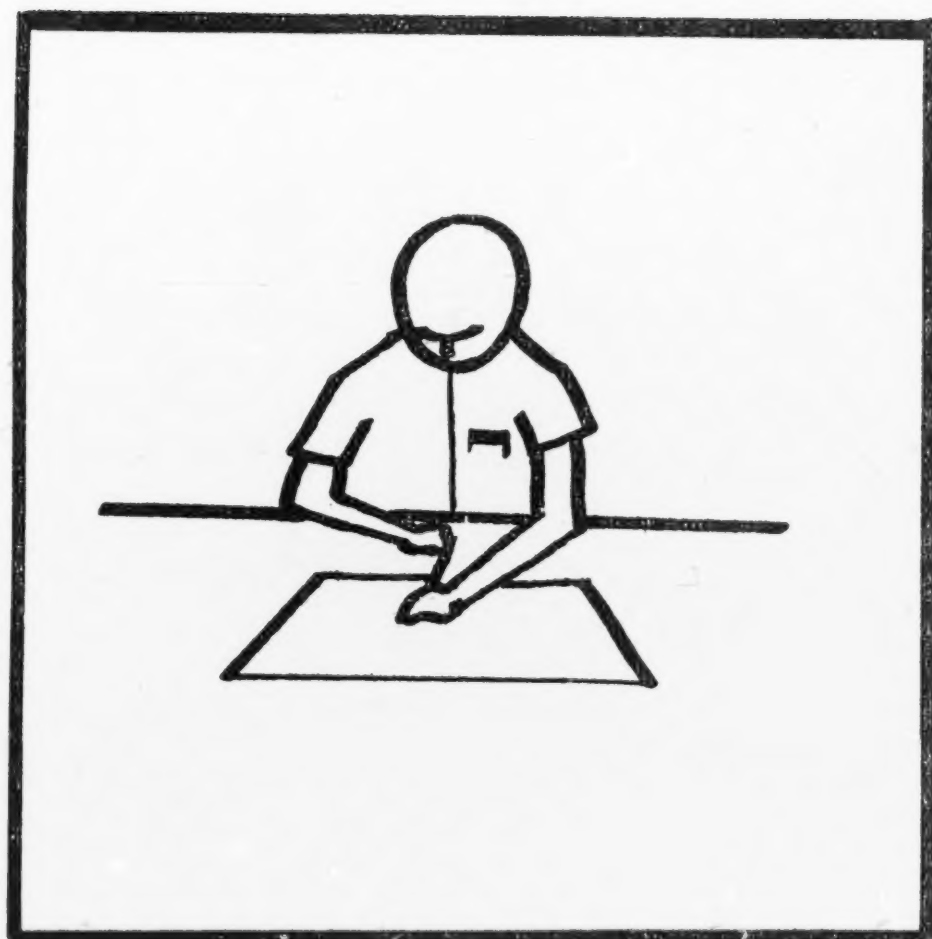
1. Develop an appreciation of vocational technology.
2. Develop an insight and understanding of employment opportunities.
3. Develop the ability and enthusiasm for continuous learning.
4. Develop basic skills in the proper and safe use of common tools, machines, and processes used in the vocational areas.
5. Develop desirable social relationships.
6. Develop the insight with which the student can become aware of his capabilities.
7. Develop marketable skills and vocational competence to meet the needs of the students.
8. Develop consumer attitude where as students can select, buy, use, and maintain the products of industry more intelligently.
9. Develop technical skills that can be applicable to the student for personal use.
10. Develop an insight into the world of work and its place in our culture.
11. Develop the abilities and enthusiasm for creative expression involving the materials, processes and products of vocational technology.
12. Develop the abilities for problem solving.
13. Develop an understanding of industrial processes and the practical application of scientific principles.

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THEMES AND THEIR RATIONALE

At each grade level a theme is identified and a rationale is indicated for that theme.

<u>Grade Level</u>	<u>Theme</u>	<u>Rationale</u>
7,8,9	Drawing	(Drawing) Mechanical drawing is a necessary basic unit to any Industrial Arts program because the student must be knowledgeable of mechanical drawing before proceeding into any type of project building. The student must form a visualization of his woodworking project before he begins construction - mechanical drawing gives the student this opportunity.
7,8,9	Wood Technology	(Woodworking) Learning about wood and how to use tools and machines is a fascinating experience. Added to this is the personal satisfaction that comes from the actual construction of attractive and useful projects with equipment that is similar to that used in industry. The popularity and importance of woodworking has prevailed because wood is easily formed and worked, is inexpensive and readily obtainable, is used extensively in construction and abounds in hobby possibilities. The student should obtain some level of proficiency in woodworking, so four semesters of woodworking will be offered.
10	General Arts and Crafts	(Crafts) The craft offerings will develop talents and creativity within the students.
11	Metal Crafts	The student will be given the opportunity to use and develop his senses in a strong interest area.
12	Ceramics	The student will gain knowledge of materials and tools which will later lead to wise use of leisure time.



DRAWING & WOOD TECHNOLOGY

GRADE SEVEN

DRAWING AND WOOD TECHNOLOGY

- I. Develop the ability to make and interpret Orthographic drawings.
 - A. The student will demonstrate his ability to letter correctly. Ex. styles, spacing and layout.
 - B. The student will develop skills in the use of drafting instruments. Ex. drawing board, T square, 30-60, and 45 degree triangles, 2H and 4H pencils, engineering rule.
 - C. The student will be able to fasten the paper to the drawing board, sharpen a drawing pencil, measure with a scale rule, mark off distances with a pencil, erase and clean a drawing and layout border lines and title spaces.
 - D. The student will be able to draw border, visible, hidden, and construction lines.
 - E. The student will be able to plan the space between views and the location of views.
 - F. The student will be able to draw Orthographic drawings from Isometric drawings.
 - G. The student will be able to draw views in their true lengths.
 - H. The student will be able to relate top, front and side views to each other.
- II. Develop an understanding and appreciation of wood, lumber, and forest products.
 - A. The student will be able to discuss and identify heartwood, sapwood, annual rings, pith, cambium and bark.
 - B. The student will be able to contrast and compare hardwoods with softwoods.
 - C. The student will be able to indicate how wood shrinks when it is dried.
 - D. The student will be able to discuss how trees are cut into lumber.
- III. Develop safe and desirable work habits and the ability to work cooperatively.
 - A. The student will willingly share in group responsibility.
 - B. The student will look for and correct safety hazards.
 - C. The student will obey all safety rules.
- IV. Develop the ability to plan, and execute his project.
 - A. The student will be able to estimate time limits for each project.
 - B. The student will be able to follow a step-by-step plan for each project.
 - C. The student will be able to make a bill of materials and figure cost of projects. Ex. Linear and board feet.
- V. Develop an ability and understanding of hand tools used in woodworking skills.
 - A. The student will be able to use the common measuring tools accurately. Ex. push/pull pocket tape, combination square, framing square, marking gauge, 12" wooden ruler.
 - B. The student will be able to make cuts using the common saws. Ex. back, crosscut, ripping, and coping.

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- C. The student will be able to assemble, adjust and use the common planes. Ex. Smooth, jack, jointer, and block.
- D. The student will be able to select and use efficiently the common boring and drilling tools. Ex. Brace and auger bit, hand drill and dowel jig.
- E. The student will be able to drive and draw nails using the claw hammer.
- F. The student will be able to select a screw driver of length and tip fitted to the work. Ex. Phillips and standard slot.
- G. The student will be able to cut wood using a wood chisel and mallet.

VI. Develop the ability and skill in joinery and fastening.

- A. The student will be able to layout, cut and fit dado, dowel, butt, and rabbet joints.
- B. The student will be able to select correct fasteners. Ex. screw-round, oval, and flat; nails - common, box, casing, finish, brad; dowels; glue - polyvinyl.
- C. The student will be able to select clamps for assembly. Ex. bar, handscrew, and C.

VII. Develop the skill in preparing a wood surface for finishing.

- A. The student will identify the kind and grade of abrasive papers. Ex. flint and garnet (natural); silicon carbide and aluminum oxide (manufactured); grade - fine, medium, and coarse (sieve and mesh system).
- B. The student will be able to raise dents in wood surfaces using a damp cloth and soldering iron.
- C. The student will be able to fill small holes and gaps using appropriate wood fillers.

VIII. Develop the skills in applying finish to wood.

- A. The student will apply a surface coat of shellac (sealer) and a finish coat of varnish.
- B. The student will be able to demonstrate his ability to clean a paint brush.

Example of Behavioral Instructional Objective:

7th Grade Drawing

The student will letter legibly on paper - single stroke, vertical upper case letters, his name, date, and plate number on each and every drawing.

7th grade Woodworking

The student will construct with wood a dado joint, using hand tools and methods as demonstrated in class.

Resources:

Text: Woodworking, Willis H. Wagner, Goodheart - Wilcox, 1968.

Sample Texts:

Modern General Shop - Brown, Wagner, Boyd, Gerrish - Goodheart-Wilcox, 1965.
Instructional Units in Hand Woodworking - Tustison, Brown, Barocci - Bruce

Publishing Co., 1954

Practical Finishing Methods - Delta Crafts, 1954

General Shop Bench Woodworking - Fryland & LaBerge, 1955

Elementary I.E. - Gerbracht & Babcock, 1969

Wood Pulp - A Basic Fiber - U.S. Pulp Producers, Assoc., 1955

Finishing Materials and Methods - George A. Sodenberg, 1959

* I.A. Bench Woodworking - Groneman & Glazener, McGraw-Hill

* Wood Finishing - Harry R. Jeffrey, Bennett Books

* The Use of Hand Woodworking Tools - McDonnell, Delmar Publishers

* Finishing Technology - George A. Sodenberg, McKnight & McKnight

* General Shop Project - Manley L. Zanco, McKnight & McKnight

Library Books:

600 Things to Make - Glen Cook, 631 Coo

General Woodworking - Chris H. Groneman, 684.08 Gro

Basic Woodwork Project - Harry McGinnis, 684.08 McG

Woodworking for Everyone - John G. Shea, 684.08 She

Wood Finishing - Robert Scharff, 698 Sch

Films

Industrial Arts - A Safe Shop, 691 Ind

Filmstrips

First Course in Mechanical Drawing, 744

Orthographic Drawing, Part I, 744.4e

Orthographic Drawing, Part II, 744.4f

Freehand Lettering with guide, 744.4j

Movies

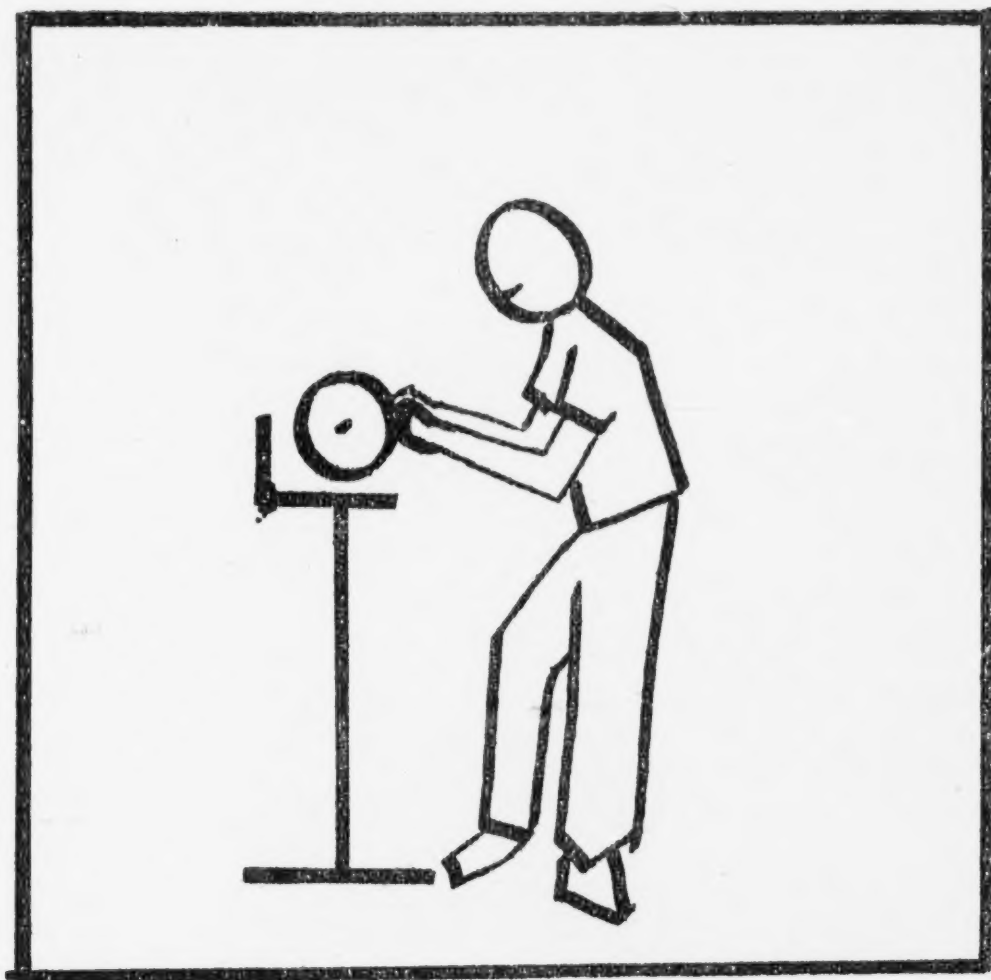
Orthographic Projection, 744.4 ort

Language of Drawing, 744.4 lan

Transparencies

Mechanical Drawing Set, Mec

* Indicates that these materials are not at the Fort Benton School System; however, they are recommended for purchase.



WOOD TECHNOLOGY

GRADE EIGHT

DRAWING AND WOOD TECHNOLOGY

- I. Develop the ability to make and interpret Isometric Drawings.
 - A. The student will be able to draw Isometric drawings from Orthographic drawings.
 - B. The student will be able to plan the location of the drawing on paper.
 - C. The student will draw all object and hidden lines.
- II. Develop the fundamentals in performing operations involving power machines.
 - A. The student will be able to identify the common lathe tools. Ex. square nose, round nose, spear point, parting tool, skew, and outside caliper.
 - B. The student will be able to mount, turn, set, and use calipers in producing objects on the lathe.
 - C. The student will select and mount proper drill bits and drill holes using the drill press and portable hand drill.
 - D. The student will be able to adjust, change blades, and cut straight lines and curves using the band and jig saws.
 - E. The student will be able to demonstrate his ability to operate the stationary and portable sanding machines.
- III. Develop an appreciation and understanding of tool sharpening and maintenance.
 - A. The student will be able to recognize a dull tool.
 - B. The student will be able to sharpen chisel, knives, and plane irons using the power grinder and oil stone.
- IV. Develop the ability to construct joints using hand tools.
 - A. The student will be able to construct a miter joint using the miter box.
 - B. The student will be able to construct a rabbet and cross lap joint using hand tools.
- V. Develop the ability to apply finishes to wood products.
 - A. The student will be able to apply stains and oil finishes.
 - B. The student will be able to sand and apply a french polish (shellac and linseed oil) to a finished lathe project.
- VI. Develop an understanding of the safe operation and procedure in using hand and power tools.
 - A. The student will obey all safety rules.
 - B. The student will demonstrate the proper use of all safety equipment.

Example of Behavioral Instructional Objective:

8th Grade Drawing

Given ten orthographic drawings, the student will draw on paper using instruments, seven Isometric drawings.

8th Grade Woodworking

The student will form from a plan, one wood spindle lathe project at 1/8" tolerance.

Resources:

Text: Modern Woodworking - Willis H. Wagner, Goodheart-Wilcox, 1970.

Sample Texts:

Instructional Units in Hand Woodworking - Tustison, Brown, Barocci - Bruce Publishing Co., 1954

Getting the Most Out of Your Abrasive Tools - Delta Crafts, 1954

Getting the Most Out of Your Drill Press - Delta Crafts, 1954

Practical Finishing Methods - Delta Crafts, 1954

General Shop - Walter Brown, 1964

Woodburning Visualized - Ross Cramlet, 1966

Finishing Materials and Methods - George A. Soderberg, 1959

* Woodshop Tool Maintenance - Cunningham & Holtrop, Bennett Books

* The Art of Woodburning - William W. Klemke, Bennett Books

* Wood Finishing - Harry R. Jeffrey, Bennett Books

* The Use of Hand Woodworking Tools - McDonnell, Delmar Publishing Co.

* Finishing Technology - George A. Soderberg, McKnight & McKnight

* Machine Woodworking - Robert E. Smith, McKnight & McKnight

* General Shop Project - Manley L. Zanco, McKnight & McKnight

* Wood Turning - Eldon Redhorn, McKnight & McKnight

Library Books:

Plywood Working For Everyone - John G. Shea, 684.08 She

600 Things to Make - Glen Cook, 631 Co

General Woodworking - Chris H. Gronman, 684.08 Gro

Basic Woodwork Project - Harry McGinnis, 684.08 McG

Woodworking for Industry - John L. Feirer, 694 Fei

Wood Finishing - Robert Scharff, 698 Sch

Periodicals

Workbench - Modern Handcraft, Inc.

IAVE - Bruce Publishing Co.

Industrial Arts - Goodheart-Wilcox

Super 8mm Silent Filmloops

Sharpening Plane Irons and Chisels, 621.9 She

Belt and Orbital Sanders

* Power Tool Series, B.F.A. Educational Media

Filmstrips

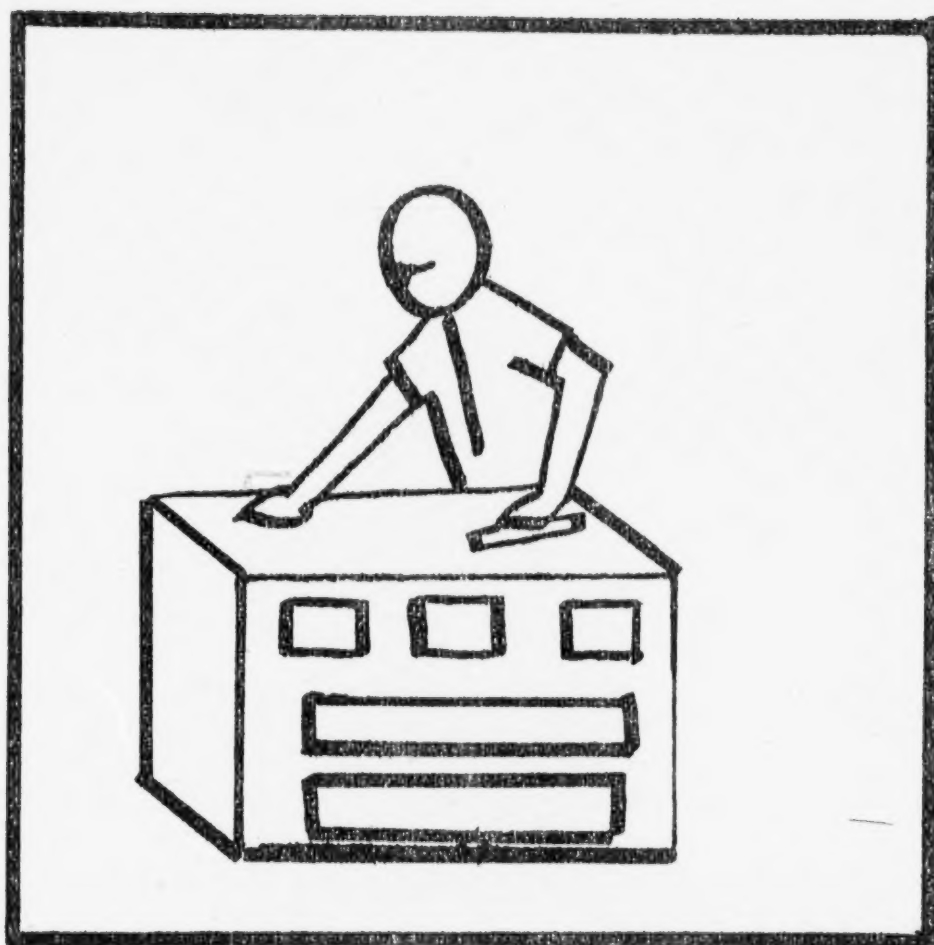
Freehand Lettering with guide, 744.4j

Isometric Drawing, 744.4m

Transparencies

Mechanical Drawing Set, Mec

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ADVANCED WOOD TECHNOLOGY

GRADE NINE

ADVANCE WOOD TECHNOLOGY

- I. Develop the ability to make and interpret working drawings.
 - A. The student will develop a set of scale plans for a woodworking project.
 - B. The student will be able to dimension fully using arrowheads, extension lines, and dimension figures.
 - C. The student will be able to locate centers, draw circles and arcs, and curves using drawing instruments.
 - D. The student will be able to figure a bill of material and a planning procedure.
 - E. The student will be able to develop a legend showing specifications.
- II. Develop the ability to select and use proper wood and wood products.
 - A. The student will be able to look for construction features in judging value.
 - B. The student will be able to buy woods on the basis of needs and quality rather than price.
 - C. The student will be able to identify grades and defects in wood.
- III. Develop the fundamentals and skills in correctly performing operations involving power machines.
 - A. The student will identify, remove, and mount various circular saw blades.
 - B. The student will set up and use the circular saw for ripping and crosscutting.
 - C. The student will cut angles and joints with the circular saw. Ex. Dado, miter, cross alp, butt, tongue and groove, rabbet, bevels, camfers, tenons and box joints.
 - D. The student will set and use the radialarm saw for ripping, cross-cutting, miter and angle cutting.
 - E. The student will be able to cut straight lines using the portable circular saw.
 - F. The student will be able to cut circles and arcs using a saber saw.
 - G. The student will be able to change and adjust cutters on the portable router.
 - H. The student will be able to adjust and operate the jointer and planner.
 - I. The student will be able to make faceplate lathe projects.
 - J. The student will follow all safety rules and procedures in using the power tools.
- IV. Develop the skill and understanding of tool sharpening and maintenance.
 - A. The student will be able to sharpen and set a circular saw blade.
 - B. The student will be able to sharpen a drill bit.
 - C. The student will be able to sharpen and set a hand saw.
- V. Develop the ability and further understanding of the woodfinishing processes.
 - A. The student will be able to apply stains, liquid or paste fillers, sealers, and finishes.

- B. The student will be able to rub a finish using steel wool, or rubbing oil with pumice or rottenstone.

Example of Behavioral Instructional Objective:

The student will sharpen and set a combination circular saw blade with a file and saw set so that it cuts wood smoothly and without burning.

Resources:

Text: Modern Woodworking - Willis H. Wagner, Goodheart-Wilcox, 1970

Sample Texts:

- Principles of Woodworking - Holtrop & Hjorth, Bruce Publishing Co., 1961
General Shop II - Bruce Publishing Co., 1962
Getting the Most Out of Your Circular Saw and Jointer - Delta Craft, 1954
Getting the Most Out of Your Shaper - Delta Craft, 1954
Getting the Most Out of Your Radial Saw - Delta Craft, 1954
Getting the Most Out of Your Band Saw and Scroll Saw - Delta Crafts, 1954
Practical Finishing Methods - Delta Crafts, 1954
Woodturning Visualized, Ross Cramlet, 1966
Finishing Materials and Methods - George A. Soderberg, 1959
* Power Tool Maintenance - Daniel Irvin, McGraw-Hill
* Technical Woodworking - Groneman & Graener, McGraw-Hill
* Advanced Woodworking & Furniture Making - John L. Feirer, Bennett Books
* The Art of Woodturning - Eilliam W. Klemke, Bennett Books
* Wood Finishing - Harry R. Jeffrey, Bennett Books
* The Use of Portable Power Tools - McDonnell, Delmar Publishing
* Finishing Technology - George A. Soderberg, McKnight & McKnight
* Machine Woodworking - Robert E. Smith, McKnight & McKnight
* General Shop Project - Manley L. Zanco, McKnight & McKnight
* Wood Turning - Eldon Redhorn, McKnight & McKnight

Library Books:

- Plywood Working For Everyone - John G. Shea, 684.08 She
600 Things to Make - Glen Cook, 631 Co
General Woodworking - Chris H. Gronemen, 684.08 Gro
Basic Woodwork Project - Harry McGinnis, 684.08 McG
Woodworking for Industry - John L. Feirer, 964 Fei
Wood Finishing - Robert Scharff, 698 Sch

Periodicals

- Workbench - Modern Handcraft Inc.
IAVE - Bruce Publishing Co.
Industrial Arts - Goodheart-Wilcox

Super 8mm Silent Filmloops

- Saber Saw: Wood Cutting
Portable Circular Saw Series
(a) Types of Saws & Adjustments
(b) Ripping
(c) Crosscutting

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Filmstrips

Sectional Views, 744.4a
Auxiliary View and Related Construction, 744.4b
Dimensioning, Part I, 744.4c
Dimensioning, Part II, 744.4d
Compasses and Bow Instruments with guide, 744.4h
Scales, 744.4k
Developments, 744.4l

Transparencies

Mechanical Drawing Set, Mec

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GENERAL ARTS & CRAFTS

GRADE TEN

GENERAL ARTS AND CRAFTS

I. Develop an understanding and skills of potato, linoleum, wood and silk screen printing.

- A. The student will be able to prepare the surfaces for cutting and printing.
- B. The student will be able to transfer the design onto the printing surface.
- C. The student will be able to sharpen all curving tools.
- D. The student will be able to cut and carve the print block.
- E. The student will be able to print using colored inks.
- F. The student will be able to make a frame and mount silk on the frame.
- G. The student will be able to make, identify and use paper, glue, touche¹⁰, and lacquer film stencils.
- H. The student will be able to use and identify the different cleaning techniques.
- I. The student will be able to perform all operations in a safe, efficient, and systematic manner.

II. Develop an understanding and skills of leather working.

- A. The student will be able to identify tanning processes, types and structure of leather.
- B. The student will be able to identify, select, use and sharpen the common leather tools.
- C. The student will be able to prepare the leather, cut and lay out the design, do outline tooling, flat modeling, embossing, set stamping and carving.
- D. The student will be able to use techniques of structural assembly, e.g., lacing, stitching, splicing, and sewing.
- E. The student will be able to attach fasteners.
- F. The student will be able to identify and use dyes and finishing materials.
- G. The student will be able to perform all operations in a safe, efficient, and systematic manner.

III. Develop an understanding and skills of sculpture.

- A. The student will be able to cut, carve, or shape a simple sculpture out of soap, wood, plaster and/or wire.
- B. The student will be able to prepare the medium for use.
- C. The student will be able to use and keep in good working order all tools used for sculpture.
- D. The student will be able to perform all operations in a safe, efficient and systematic manner.

IV. Develop an understanding and skills of plastics.

- A. The student will be able to heat and compress a block of plastic.
- B. The student will be able to internal carve using tapered drills and burrs.
- C. The student will be able to return a compressed block of plastic back into its original shape.

- D. The student will be able to dye an internal carved project.
 - E. The student will be able to perform cementing, buffing and polishing operations on plastic cubes.
 - F. The student will be able to engrave, buff, and polish a sheet of plastic.
 - G. The student will be able to perform all operations in a safe, efficient and systematic manner.
- V. Develop an understanding and skills of dying textiles (Batik¹ and tie-dying).
- A. The student will be able to mix dyes properly.
 - B. The student will be able to tie knots, apply wax, and dye textiles to achieve colored patterns.
 - C. The student will be able to use proper cleaning techniques.
 - D. The student will be able to do all operations in a safe, efficient and systematic manner.
- VI. Develop an understanding and skills of Card Weaving.
- A. The student will be able to make a colored design on paper.
 - B. The student will be able to make and string the cards.
 - C. The student will be able to weave and apply fasteners.
 - D. The student will be able to perform all operations in a safe, efficient and systematic manner.
- VII. Develop an understanding and skills in candle making.
- A. The student will be able to prepare wicks and waxes.
 - B. The student will be able to form candles by dipping and moulding.
 - C. The student will be able to form multi-layered candles.
 - D. The student will be able to decorate candles by pressing, cutting, coloring, glueing, melting and pouring.
 - E. The student will be able to perform all operations in a safe, efficient and systematic manner.
- VIII. Develop an understanding and skills in forming objects with liquid acrylic plastics.
- A. The student will be able to create structures by bending wire to the desired shape and dipping into liquid acrylic-plastics.
 - B. The student will be able to decorate by adding tinsel, glitter and sequins with glue.
 - C. The student will be able to combine each individual piece into a floral arrangement, jewelry, ornaments and other imaginative designs.
 - D. The student will be able to perform all operations in a safe, efficient and systematic manner.
- IX. Develop an understanding and skills in special projects.
- A. The student will be able to pursue any one or more of the crafts in more detail. He will also be able to explore any other craft area not offered which is up to the instructors' discretion. However, each student will be encouraged to follow the sequence.

Example of Instructional Behavioral Objective:

10th Grade General Arts and Crafts

Printing

Given a block of wood and carbon paper, the student will transfer a design onto the wood by using a pencil.

Sculpture

Given a bar of soap and a set of carving tools, the student will carve an animal likeness that can be identified by the instructor.

Plastics

Given a plexiglas block, the student will internally carve it with tapered drills so that a recognizable design will exist.

Tie Dye and Batik

Given a package of dye the student will mix it with water according to the manufacturers instruction.

Candle Making

The student will dip a wick into hot wax several times to form a straight cylindrical candle.

Form a Film

The student will dip several wire shapes into liquid acrylic plastic to form a recognizable arrangement.

Card Weaving

Given several seaving cards, the student will number, letter and arrange them consecutively.

Leather

Given a piece of leather, the student will properly prepare the leather for tooling.

Leather Resources:

Books:

Modern Upholstery Methods - William Tierney, 1965
Leathercraft - Fred Zimmerman, 1961
General Leathercraft - Raymond Cherry, 1965
Craftwork - Franklin Gottshall, 1954
Arts and Crafts - 745.5
Arts and Crafts - G. Peterson, 1960, 745.531 Pet
Handicraft - E. Jaegar, 745.9 Jae

(18)

Handicraft - Joseph Leeming, 1960, 746 Lee
Handicraft - William Wankelman, 700 Man
Handicraft - Esther Hautzig, 745.5 Hau
Handicraft - Bernice Carlstrom, 1950, 745.5 Car

Transparencies:

Leather Working, 745. Lea

Filmstrips:

Handicraft, Art 700 Hayes
Intermediate Series: 8 filmstrips, 700 Crafts:
a) Pottery-making e) Potato Print
b) Weaving f) Water Colors
c) Papercraft g) Making Murals
d) Stenciling h) Sketching with crayons

Sculpture Resources:

Books:

Sculpture - Lillian Johnson, 1960
Sculpture for Beginners - Maria & Louis DiValentin, 1969
Metal and Wire Sculpture - Elmar Gruber, 1970
Direct Metal Sculpture - Meilach and Seiden, 1966
Ceramic Sculpture - John Kenny, 1953

Textiles Resources:

Books:

- * The Hand Decoration of Fabrics - F. J. Kafka 15-512, Nasco House of Crafts No. 113
- Design on Fabric - Ellen Bystrom, Van Nostrand Reinbold Co.
- * Printing on Fabric - Johnston and Kaufman, Van Nostrand Reinbold Co.

Filmstrips:

Tie Tying Textiles, 746.6
Batik I & II, 746.6b

Batik Resources:

Books:

Batik Art and Craft - Nikkrevitsky, 15-513, Nasco House of Crafts No. 113
Batik Handbook - by Craftools 15.512 p. 305, Nasco House of Crafts No. 113

- * Indicates that these materials are not at the Fort Benton School System; however, they are recommended for purchase.

Card Weaving Resources:

Books:

- * Weaving Is Fun - Jean Wilson, Van Nostrand Reinbold Co.
- * Weaving Is For Everyone - Jean Wilson, Van Nostrand Reinbold Co.
- * Weaving and Needlecraft Color Course - William & Doris Justema, Van Nostrand Reinbold Co.
- * New Design in Stitchery - Van Nostrand Reinbold Co.
- * New Design in Weaving - Van Nostrand Reinbold Co.

Printing Resources:

Books:

- Silk Screen Printing - Eisenberg & Kafka, 1957
- Potato Printing - Susanne Strose, 1969
- Prints (from Linoblocks and Woodcuts) - Manly Banister, 1967
- Block and Silk Screen Printing - Ahlberg & Jarneryd
- The Craft of Woodcuts - John Biggs, 1963
- Design - Downer & Marian, 1947, 745
- Abstract Art - John Lynch, 1953, 731 Lyn
- * Screen Process Printing - Schwalbach, Ran Nostrand Reinbold Co.

Super 8mm Silent Filmloops: BFA Educational Media

- * Making and Stretching Your Own Frame
- * Stretching the Commercial Frame
- * Masking the Frame
- * Shellacking the Frame
- * Preparing the Stencil
- * Printing the Stencil

Filmstrips:

Art Design, 740 Des
Art Pictures, Painting, 750 pai

Plastics Resources:

Books:

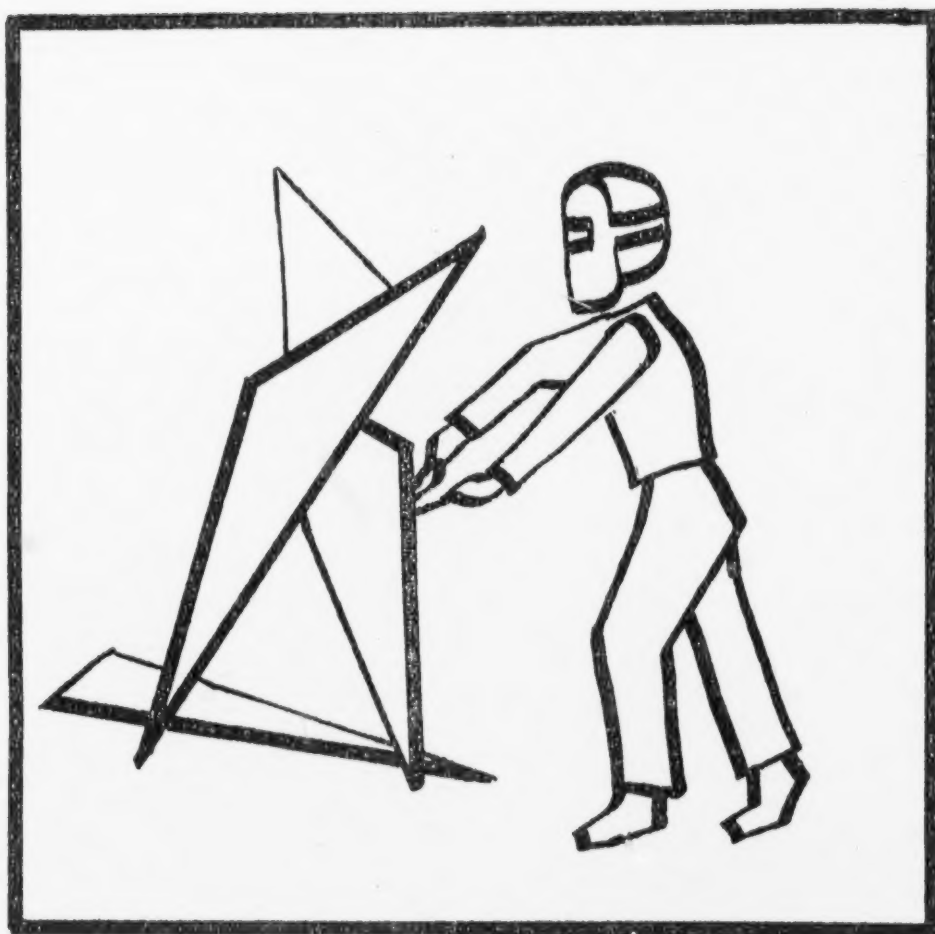
- General Plastics - Raymond Cherry, 1941
- Sheet Metal Chapter 16, Plastics p. 217 - Bruce and Meyer
- The Miracle of Plastics - J. Gordon Cook, 1964
- How to Create with Liquid Acrylic Plastic - Pat & Robbie Inc., 1968

Candle Making Resources:

Books:

Candle Making - Susanne Strose, 1970

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METAL CRAFT

GRADE ELEVEN

METAL CRAFTS

I. Develop skills and an understanding of metal tooling.

- A. The student will be able to select, trace and transfer a pattern onto copper or aluminum.
- B. The student will be able to tool the metal using the common metal tooling tools.
- C. The student will be able to fill the back with sawdust and shellac.
- D. The student will be able to finish the picture using oxidation chemicals (potassium sulfide or sodium sulfide), colored flock, or paint.
- E. The student will be able to mat or frame the finished picture.
- F. The student will be able to perform all operations in a safe, efficient and systematic manner.

II. Develop an understanding and skills of metal spinning.

- A. The student will be able to identify the common metal spinning tools.
- B. The student will be able to mount and set up the form, metal disc, and follow block.
- C. The student will be able to true the copper or aluminum disc.
- D. The student will be able to force the metal against the chuck.
- E. The student will be able to roll a small loop on the edge.
- F. The student will be able to polish the surface.
- G. The student will be able to fit and attach appendages to the spun object.
- H. The student will be able to apply enamel to the copper spun object.
- I. The student will be able to perform all operations in a safe, efficient and systematic manner.

III. Develop skills and an understanding of Metal Enameling.

- A. The student will be able to prepare copper for enameling by removing all traces of oxidation.
- B. The student will be able to apply the enamel powder.
- C. The student will be able to fire the enameled copper.
- D. The student will be able to make and apply a stencil and brush a design on a base coat of enamel.
- E. The student will be able to apply various types of fasteners.
- F. The student will be able to finish by filing or sanding exposed oxidized areas.
- G. The student will be able to make and apply a cloisonne⁴ design.
- H. The student will be able to apply enamel onto his metal spinning project.
- I. The student will be able to perform all operations in a safe, efficient and systematic manner.

IV. Develop an understanding and skills in lost wax casting⁷.

- A. The student will be able to design and make a model of the finished product in wax.
- B. The student will be able to sprue⁹ and mount his pattern.
- C. The student will be able to measure his pattern to determine the amount of metal needed.
- D. The student will be able to invest his pattern in a special heat-resistant plaster.

- E. The student will be able to burn out his wax pattern.
- F. The student will be able to mount and balance the casting machine.
- G. The student will be able to make the cast on a centrifugal casting machine.
- H. The student will be able to finish and polish his casting.
- I. The student will be able to make a lost wax setting for a lapidary stone.
- J. The student will be able to perform all operations in a safe, efficient and systematic manner.

V. Develop an understanding and skills in lapidary.

- A. The student will be able to cut, grind, and polish stones to fit a template.
- B. The student will be able to cut from a slab, oval, round, square and irregular shapes.
- C. The student will be able to mount stones into standard fittings, and one lost wax cast fitting.
- D. The student will be able to perform all operations in a safe, efficient and systematic manner.

VI. Develop an understanding and skills in special projects.

- A. The student will be able to pursue in any one or more of the crafts in more detail. He will also be able to explore any other craft area not offered which is up to the instructors' discretion. However, each student will be encouraged to follow the sequence.

Example of Behavioral Instructional Objective:

Metal Tooling

With a sharp pencil, the student will trace a design onto a piece of cloth tracing paper.

Metal Spinning

Given a flat disk of copper and a wooden form, the student will form a cylindrical dish on the lathe using the common forming tools.

Metal Enameling

Given a preformed copper object, the student will apply enamel and fire it until the enamel becomes smooth and glossy.

Lost Wax Casting

Given a piece of wax and some modeling tools, the student will design a ring with at least one surface irregularity.

Lapidary

The student will cut, grind, and polish an oval stone on the lapidary machine so that it fits a standard template at 1/8" tolerance.

Lost Wax Casting Resources:

Books:

- Art Metalcraft Casting Catalog - KEER Manufacturing Co., 1970
Lost Wax Casting - Midwest Shop Supplies, 1971, p. 537
Lost Wax - 2nd Edition, The New Modern Craft Booklet
* Centrifugal Casting As A Jewelry Process - Story, Allcraft Tool and Supplies Co., No. 68
* Creative Casting, Sharr-Choate, Allcraft Tool and Supply Co. No. 68, pp. 86-87
* Jewelry Making By the Lost Wax Process - Greta Pack, Van Nostrand Reinbold Co.

Lapidary Resources:

Books:

- * The Book of Agates - L. Quick, Midwest Shop Supplies, 1971 No Bp-5855, p. 548
Craftool Lapidary and Jewelry Charts for School Charts - Midwest Shop Supplies 1971 NO. BP-77, p. 548
The Art of Lapidary - Sperisen, Midwest Shop Supplies, 1971 No. BP-77
* Gem Cutting - John Sinkankas, Allcraft Tool & Supply Co. No. 68, pp. 86-87
* Gemcraft, How to Cut and Polish Gemstones - Quick & V. Lieber, Midwest Shop Supplies, 1971, No. BP-52

Metal Crafts Resources - Metal Tooling - Metal Enameling - Spinning Metal

Books:

- Copper Tooling - Almarin Pauly, 1948
Repoussage - Yves Meriel-Bussy, 1970
Creative Enameling & Jewelry Making - Katharina Zechlin, 1969
Sheetmetal Work - Robert Smith, 1961
Alcoa Aluminum Handbook - Alcoa Aluminum Co., 1957
Tincraft - Chris Groneman, 1955
Riveting Alcoa Aluminum - Alcoa Aluminum Co., 1958
Metalwork - M. J. Ruley, 1968
Art-Metalwork - Joseph J. Lukowitz, 1936
Art Metals - C. Vernon Siegner, 1961
Metal Work - Ludwig, 1962
Bench Metalwork - Robert Smith, 1961
Metal Etching, Spinning, Raising and Tooling - Robert Smith
* Enameling on Metal - Oppo Untracht, Midwest Shop Supplies 1971 No. BP-1969
* Enameling Art on Metal - Edward Winter, Midwest Shop Supplies, 1971 p. 524
* Enameling: Principles & Practice - Kenneth Bates, Midwest Shop Supplies 1971 p. 524

- * Indicates that these materials are not at the Fort Benton School System; however, they are recommended for purchase.



CERAMICS

GRADE TWELVE

CERAMICS

I. Develop an understanding and skills of ceramics.

- A. The student will be able to identify the kinds of clay and the tools used in working clay.
- B. The student will be able to form pottery by the pinch, coil, slab and wheel methods.
- C. The student will be able to make and use slip molds.
- D. The student will be able to decorate pottery by slip trial, sponged slip, paper mask, wax resist, mishima, and soraffito methods.
- E. The student will be able to glaze pottery by brushing, dipping, and pouring methods.
- F. The student will be able to stack and fire the kiln.
- G. The student will be able to perform all operations in a safe, efficient and systematic manner.

II. Develop an understanding and skills in special projects.

- A. The student will be able to pursue any one or more of the crafts in more detail. He will also be able to explore any other craft area not offered which is up to the instructors' discretion. However, each student will be encouraged to follow the sequence.

Example of Behavioral Instructional Objective:

Given a ball of clay, the student will center it on potters wheel as demonstrated in class.

Ceramic Resources:

Books:

- Handcraft Projects - Frank Solar, 1926
- Ceramics - Thomas Brennan, 1964
- Ceramics - Harry Zarchy, 1954
- Ceramics - Joan Priolo, 1969
- Ceramics - Lane Mitchell, 666.3 Mit
- * The Complete Book of Pottery Making - John Kenny, Midwest Shop Supplies, 1971 P. 503 No BP-68
- * Clay and Glazes for the Potter - Daniel Rhodes, Midwest Shop Supplies, 1971 P. 503 No. BP-97
- * Stoneware and Porcelain - Daniel Rhodes, Midwest Shop Supplies, 1971, P. 503 No. BP-52
- * Ceramic Design - John Kenny, Midwest Shop Supplies, 1971 No. BP-5830 P. 503
- * Throwing on the Potter's Wheel - Thomas Sellers, 13-335, Nasco House of Crafts No. 113

* Indicates that these materials are not at the Fort Benton School System; however, they are recommended for purchase.

Super 8mm - BFA Educational Media

- * Fan Brush Decorations
- Sponge Painting
- Design & Motion - A Cylinder
- Throwing a Cokkie Jar and Lid
- Bowl-Made and Decorated in Motion
- Stacking and Firing for Bisque
- Stacking and Firing for Glazeware

Filmstrips:

Art, Clay Modeling, 731 Clay

Filmloops:

Making a Bowl, 738.1
Making a Lid, 738.1
Wedging, 738.1
Making Handles, 738.1

Periodicals:

Ceramics Monthly - Professional Publications, Inc.
Craft Horizons - American Crafts Council
Art in America - Art in America Inc.

* Indicates that these materials are not at the Fort Benton School System; however, they are recommended for purchase.

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REVISION

The Vo-Tech curriculum was derived to create an organized pattern for the learning development of our students. As in any aspect of life, change is inevitable; therefore, we must constantly evaluate and revise this guide. The following evaluation instrument is to be completed by each teacher involved with this curriculum near the end of each semester.

EVALUATIVE INSTRUMENT

1. Are the themes indicated in this curriculum meaningful and relevant? If so, how? If not, why not?
2. Do the major concepts help develop the theme at that level? If so, how? If not, why?
3. Are the behavioral sub-concepts helpful in developing the main concepts? If not, list those that need revision.
4. Are the concepts suited to the level and abilities of the students? If not, what do you suggest?
5. Are there any concepts that should be omitted? If so, which ones and why?

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6. In your opinion are there any concepts that could and should be added? If so, why?
7. Is the content of the theme too great to be covered in the allotted time? If so, what would you delete?
8. Please list any new materials and ideas you have found helpful in your efforts to teach the concepts indicated.
9. Indicate those teaching approaches that you are using and list any others that you find useful.
10. What is your opinion of the total curriculum? Please explain.

APPENDIX A

SURVEYING FORT BENTON'S INDUSTRIAL ARTS EFFORTS

Those staff members responsible for any portion of the industrial arts program were asked to respond to the attached survey instrument. The instrument is short and is composed of three parts. Each instructor was asked to indicate (1) the nature of the Industrial Arts offering at their level of instruction; (2) what the instructor considered the strengths of that offering; and (3) what the instructor considered the weaknesses of that offering.

The feedback obtained from this instrument is summarized as follows:

1. Fort Benton's past areas of emphasis were:

7th Grade	Mechanical Drawing (isometric and orthographic projections); basic use of woods, tools, finishes, and joints.
8th Grade	Review mechanical drawing and expand on use of woods, tools, finishes and joints.
9-10th Grades	Mechanical Drawing (orthographic projections); power tools, finishes, joints, tool sharpening, veneering.
11-12th Grades	Working drawings, special topics.

2. Strengths:

- a. Theoretically began with drawing and worked towards the finished product.

3. Weaknesses:

- a. Lack of organization.
- b. No direction.
- c. No guide lines.
- d. No real indication as to "what" should be taught.
- e. Lack of materials - project and resource.
- f. Lack of adequate woodworking tools.

SCHOOL-SYSTEM SELF SURVEY

This survey is being distributed to those members of our staff responsible for any portion of our Vo-Tech program - Commercial - Each teacher is asked
Industrial Arts
Vo-Ag
Home Ec.
T & I

to reply to all the statements.

Teacher's Name _____

Teacher's Grade Level _____

I. What is the Nature of the Vo-Tech Offering presently at your grade level?
(i.e. what themes, concepts, ideas, etc. do you teach with reference to
Vo-Tech during the course of the year?)

a) Major Themes or Topics _____

b) Units _____

c) Concepts _____

d) Others _____

Comments:

(29)

II. What do you consider to be the strengths of this offering?

III. What do you consider to be the weaknesses of this offering?

APPENDIX B
CURRICULUM DEVELOPMENT SURVEY

Various college professors, learning laboratory representatives and State Department representatives were asked to respond to the attached instrument. The purpose was to obtain informative data in the English (Language Arts), Math, Science and Vo-Tech Curriculum areas. The instrument was designed to consider two major areas: (1) General information concerning the individual and agency that individual represented and (2) Specific curriculum information.

Thirty-one questionnaires were distributed; fourteen were returned. The following is an attempt to summarize the information.

It appears as if very few schools in the state are known to be developing curriculum guides at this time. Even though it was felt that many schools are beginning to do "something" in the realm of curriculum, the survey respondents did not for the most part indicate recommended places to visit. Of the programs and schools mentioned as doing "something" in curriculum, it appeared that all had a tendency to be striving toward some form of individualization in those curriculum areas being studied.

CURRICULUM DEVELOPMENT

This survey instrument is being circulated among college professors, learning laboratory representatives and State Department representatives. The purpose is to obtain informative data in the English (Language Arts), Math, Science and Vo-Tech Curriculum Areas. Your reply to this instrument will be greatly appreciated. Results will be sent to you upon request. A return self-addressed envelope has been enclosed for your convenience.

I. GENERAL INFORMATION

1. Name of Institution or Agency you represent _____
2. Describe the lines of communication you have with local school districts in regard to curriculum development.
3. How many schools do you personally contact during the course of a year concerning curriculum development and improvement?
4. What is basically the area of concentration that you become involved with in your work with local school districts?

II. SPECIFIC CURRICULUM AREAS

1. Are you aware of any school districts that have developed or are in the process of developing curriculum guides or outlines in the areas of Language Arts, Math, Science and Vo-Tech? (If yes, please indicate.)

2. Are there any school districts you would recommend a visitation to concerning their curriculum development? (If yes, please indicate where.)

3. Are you aware of any worthwhile and interesting "new" happenings in the area of Language Arts - K-12? (If so, please relate.)

4. Are you aware of any worthwhile and interesting "new" happenings in the area of Math - K-12? (If so, please relate.)

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5. Are you aware of any worthwhile, "new" and interesting happenings in the area of Science - K-12? (Please relate.)

6. Are you aware of any worthwhile, "new" and interesting happenings in the area of Vo-Tech (Home Ec., Industrial Arts, Trades & Industry, Commercial, Vocational-Agricultural.) Please Relate.

7. Do you have any lists of reference materials that you would share with us concerning any of these curriculum areas? (If so, please enclose list and return with questionnaire.)

APPENDIX C

The following reference material was research in an attempt to make this effort as dependable as possible. It was found that no one source provided us with the exact formula for our task. However, in searching through this reference material, we were able to develop a curriculum outline we feel fits the needs of the students of Fort Benton.

1. Ahlberg, G. and Jarneryd, O. Block and Silk Screen Printing, Sterling Publishing Co. and Inc., 419 Park Avenue South, New York, N.Y., 10016, pp. 88.
2. Breggan, Thomas J. Ceramics, The Goodheart-Wilcox Co., Inc., Homewood, Illinois, 1964, pp. 96.
3. Cook, J. Gordon, The Miracle of Plastics, The Dial Press, New York, N.Y., 1964, pp. 269.
4. Dippityglas Formafilm, Pat and Bobbies, Inc., Seattle, Washington, pp. 24.
5. DiValentin, Maria and Louis, Sculpture for Beginners, Sterling Publishing Co., Inc., 419 Park Avenue South, New York, N.Y., 10016, pp. 191.
6. KEER Sybron Corporation, Art Metalcraft Casting Catalog, Southwest Smelting and Refining Co., Inc., Dallas, Texas, Box 2010, 1971, pp. 20.
7. Quinlan, Charles, Basic Beginning Problems in Mechanical Drawing, Charles Quinlan Publisher, 26 Salisbury Rd., W. Barrington, R.I., 1962.
8. Quinlan, Charles, Beginning Isometric Sketching, Charles Quinlan Publisher, 26 Salisbury Rd., W. Barrington, R.I., 1966.
9. Smith, Robert E., Etching, Spinning, Raising, Tooling, McKnight & McKnight Publishing Co., Bloomington, Illinois, 1961, pp. 87.
10. Stohlman, Al, A. D. Patten and J. A. Wilson, Leatherwork Manual, Tandy Leather Co., Fort Worth, Texas, 1969, pp. 160.
11. Stroze, Susanne, Candle Making, Sterling Publishing Co., Inc., New York, N.Y., 1970, pp. 48.
12. Wagner, Willis H. Modern Woodworking, The Goodheart-Wilcox Co., Homewood, Illinois, 1970.
13. Wagner, Willis H., Woodworking, The Goodheart-Wilcox Co., Homewood, Illinois, 1968, pp. 112.
14. Walker, John R. & Edward Plevyak, Industrial Arts Drafting, The Goodheart-Wilcox Co., Inc., Homewood, Illinois, 1964, pp. 205.